

Memo for RecordCopy No. 14

Ser. No. RAG-319

Sheets 2

November 7, 1960

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From: [redacted]

Subject: Report of Visit to [redacted]

on November 3, 1960

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The writer, accompanied by [redacted] visited [redacted] on 3 November 1960 in order to view V/H sensor equipment which this company has under development. [redacted]

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[redacted] were contacted.

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[redacted] and the writer outlined some of the requirements of a V/H sensor for our application and mentioned specifically the following: expected average value of V/H (.035 rad/sec) and the expected range of V/H ($\pm 18\%$); the existence of a severe temperature environment; the presence of a window; two cameras, convergent configuration looking through the window; low pressure (0.25 psia) Helium atmosphere; approximate active mission time duration (3 hours); and sufficient additional pertinent information to enable them to make an estimate of this system's capability to satisfy requirements.

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The [redacted] has prepared a basic breadboard of a tracking device, and an exhibit document of a proposed V/H device, a copy of which document was reported to have gone to [redacted] and [redacted]

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The operating principle of the breadboard device is taken from the [redacted] terminal guidance system. This consists of a tracking scanner whose field of view is an annulus swept at 200 cps by an approximate one degree slot at a radius of 4 degrees off axis. The output of one scan of the scanner, as measured by a type 1P21 multiplier photo detector, is quantized by a bistable multi and recorded on a magnetic track, in spatial correspondence with the angular position of the slot at each instant. During subsequent scans, the magnetic recording is "read out" and compared by cross-correlation techniques with successive incoming signals. Rotation about the scan axis can be detected as a delay or advance in phase of the newly scanned signal with respect to the recorded signal. Angular velocity about axes orthogonal to the scan axis produces velocity signals which are integrated and used to drive torquers.

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The apparatus exhibited was viewing a transparency and was shown to be capable of "lock-on" to any area at random, as contrasted to a "bright spot" tracker.

The apparatus shown was stated to have tracked a moving projected image, and to have demonstrated an acceleration capability of 3 rad/sec in a set-up using a wobbling mirror. It was stated that the tracker would perform on scenes with a contrast ratio of 2:1, although the contrast of the scene in the demonstration appeared to be higher, perhaps 10:1. Scene brightness could be as low as 5 foot-lamberts.

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The [] detailed solution of the V/H problem was not related, but it is recognized that computer techniques similar to those employed by the [] tracking-type detectors would readily be applicable.

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[] raised the question regarding the minimum tracking angle required to obtain the desired accuracy of V/H determination, pointing out the difficulty experienced by some investigators in obtaining sufficient correlation over a large enough angle, due to the changing view of the ground terrain. It appeared from the response to this question that [] may have an insufficient understanding of all the problems.

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[] felt that design of a 1% V/H device would be within their capabilities; less than 0.5% would, in their opinion, require prior feasibility study. About 50 watts of electrical power should be required. Output could be electrical, analog, digital, or mechanical analog.

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It was agreed that another type of detector might be usable in the [] device, in order to overcome temperature problems of the multiplier type.

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The packaging of electronics units for other [] equipment was exhibited and a high density appeared to be achieved, but with good accessibility.

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Delivery of a unit meeting our requirements by May appeared feasible if an almost immediate start can be made.

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The [] approach is similar to the [] approach, but depends upon correlation for tracking, and hence, should be capable of faster acquisition than the [] equipment, which must first find a spot upon which to track. The [] approach is not dependent upon a critical component, such as a vidicon or storage tube, as in [] approach, providing, the photomultiplier can be replaced by another detector.

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